We Hear That

In Brief

Last month, **Harold Kroto**, who won the 1996 Nobel Prize in Chemistry, joined the chemistry faculty of Florida State University in Tallahassee as a Francis Eppes Professor. He comes to FSU from the University of Sussex in the UK.

The French Academy of Sciences bestows its highest honor, the Grande Médaille d'Or, in Paris this month on **David Gross**, director of the Kavli Institute for Theoretical Physics at the University of California, Santa Barbara, and one of this year's physics Nobel laureates (see the story next month). The academy is recognizing his contributions to quantum field theory and particle physics and notes, in particular, his role in the establishment of quantum chromodynamics. The citation adds that Gross has also made "essential contributions to superstring theory."

On 1 September, **William Trischuk**, professor of physics at the University of Toronto, became the new director of the Canadian Institute of Particle Physics, where his term is slated to end in June 2009. He succeeded **Richard K. Keeler**, who resigned this past August to join the University of Victoria as its associate vice president of research.

To help launch its new research program in modern cosmology, the University of California, Irvine, has hired four new assistant professors in its department of physics and astronomy. **Manoj Kaplinghat** arrived in July from the University of California, Davis. **Elizabeth Barton**, who was at the University of Arizona, Tucson, and **James Bullock**, who was at the Harvard–Smithsonian Center for Astrophysics, came on board in September. **Asantha Cooray** of Caltech will join UCI in January 2005.

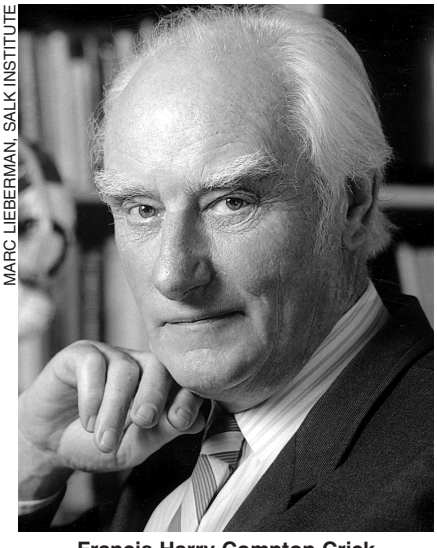
Obituaries

Francis Harry Compton Crick

In the early 1900s, relativity theory and quantum mechanics sparked a scientific revolution that laid the foundations of today's physics. Five decades later, in April 1953, the discovery of the structure of DNA by biologist James Watson and physicist Francis Crick started another revolution that forced biology to the fore of scientific thought.

DNA is so central to modern biology and its structure so elegantly intertwined with its function that the names Crick and Watson will be remembered as long as Albert Einstein and Max Planck. Francis, in particular, is responsible for much more than the discovery of DNA structure. He was the most influential figure in the first decade of molecular biology and the one who shaped its beginnings. As Jacques Monod once said to Horace Freeland Judson, author of *The Eighth Day of Creation* (Jonathan Cape, 1978), "No one man discovered or created molecular biology. But one man dominates intellectually the whole field, because he knows the most and understands the most. Francis Crick."

Francis Harry Compton Crick died on 28 July 2004 in a hospital in San Diego, California, after a long battle with colon cancer. He had been working on a new scientific paper until a few hours before his death.



MARC LIEBERMAN, SALK INSTITUTE

Francis Harry Compton Crick

Francis was born in Northampton, England, on 8 June 1916 and later studied physics at University College London. The German bombing during World War II interrupted his PhD thesis work on the viscosity of water under high pressure. During the war, he worked in military research on the design of magnetic and acoustic mines. After the war, he refused—he joked—a "tenured" job at the British Admiralty so that he could become a PhD student again. He was attracted then and later by two major mysteries: of life and of consciousness. He decided to study biology.

Thanks to funding set up to support the entry of physicists into biology, Francis was accepted in a newly formed unit at the Cavendish Laboratory to study the structure of proteins using x-ray diffraction. His physics background helped him quickly become expert at the interpretation of diffraction patterns using a combination of imagery and logic that was based on mathematics. In teaching Watson, a newly arrived American postdoc at Cavendish, how to analyze these patterns, he toyed with the idea of writing an instructional booklet entitled *Fourier Transforms for Bird Watchers*. (Watson had become a biologist because of his initial interest in bird watching.) The structure of DNA was not Francis's thesis but was what he and Watson presciently thought to be the most important question in biology.

The story of the discovery has become an almost mythic tale in science, partly because of Watson's bestseller *The Double Helix* (Weidenfeld & Nicolson, 1968). Francis, rational as always, wrote in his autobiography *What Mad Pursuit: A Personal View of Scientific Discovery* (Basic Books, 1988) that "the path to [DNA structure's] discovery was, scientifically speaking, rather commonplace. What was important was not the way it was discovered but the object discovered—the structure of DNA itself." In 1962, Francis, Watson, and Maurice Wilkins received the Nobel Prize in Medicine for the discovery of the structure of DNA.

In the decade following the discovery, Francis's contributions were much more than discovering that genes were the chapters of a gigantic book in a digital code written on DNA molecules. He also correctly deduced how that code is translated into proteins, was the first to compile the list of the 20 amino acids of which proteins are made, predicted the existence of an adaptor molecule that is now called transfer RNA, discovered that the code was written in three-letter words, and was instrumental in cracking the genetic code itself.

In 1957, he spelled out two key

theoretical statements that now permeate much of biology: the Central Dogma, in which information goes from genes to proteins but not vice versa, and the Sequence Hypothesis, which states that the specificity of DNA depends only on the sequence of bases and that sequence alone determines the amino acid sequence in a protein and thereby the protein's three-dimensional structure and function.

I met Francis in 1976, when he moved from Cambridge, England, to the Salk Institute for Biological Studies in La Jolla, California. There, he became a theoretical neuroscientist and followed his second passion, the mystery of consciousness. I saw him at neuroscience meetings and visited him at his summer house, with its golden helix above the front door.

In 1979, Francis and I worked for a month with David Marr at the Salk Institute to try to understand the connection between the architecture of the visual cortex and several intriguing aspects of visual perception. In the process, I observed his remarkably clear thinking and incredibly intense focus. After numerous hours discussing a problem with the solution still escaping us, David and I were tired, confused, and ready to give up for the day. Not Francis; he was relentless, forceful, critical, and enthusiastic. He was not a mathematician, but he knew how to use mathematics and how to visualize it.

Beginning in the 1980s, Francis worked with my first graduate student, Christof Koch, on consciousness. He knew well that solving the problem of consciousness was going to be difficult: He had titled his autobiography *What Mad Pursuit*. Francis and Christof did not manage to solve the problem, but they did show how to attack it in scientific terms and made it a legitimate problem for neuroscientists to tackle. Christof's book, *The Quest for Consciousness: A Neurobiological Approach* (Roberts, 2004), is based on his collaboration with Francis since 1989.

Rationality was Francis's driving force. In fact, he may have been too rational even for his own children, but he was tolerant of people's small superstitions. He did not suffer fools who made claims based on flimsy evidence; for him, scientific theory was to be based on hard facts. At the same time, he was extremely patient with curious people. After a talk, when he must have been quite tired, he gently answered what seemed endless questions from students and others who had stayed after the huge audience had left.

Francis made great discoveries without being eccentric, jealous, self-obsessed, or thirsty for power and fame. He didn't seek a career in administration, nor did he try to build a large research group. One of his own rules, which he strictly followed, was to avoid being too busy and taking on too many commitments. He tried to be somewhat "underemployed," as he called it, so that he would have time to devote to a good problem or idea if one came along. As Watson said in a 1998 interview (quoted in the *New York Times*, 29 July 2004), "Francis . . . never tried to promote himself. He was just interested in solving problems."

In the last years of his life, Francis accepted his disease without worrying about it. His enthusiasm for science and for conversation with friends continued unabated. A few weeks before he died, he talked to me enthusiastically about a paper he and Christof were writing on the possible role of consciousness in a little known brain structure called claustrum.

During the last years, I came to admire Francis as a person as well as a scientist. I marveled at the youthful spirit that he and his wife, Odile, maintained and how refreshing it was to visit with them.

Francis is sorely missed, but his mind will live on through his papers, books, letters, and our own memories.

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Massachusetts Institute of Technology
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with

Martino D. Poggio
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Marshall Nicholas Rosenbluth

Marshall Nicholas Rosenbluth, a brilliant theoretician, died on 28 September 2003 in San Diego, California, after a two-year struggle with pancreatic cancer.

Born on 5 February 1927 in Albany, New York, Rosenbluth graduated from Stuyvesant High School in New York City and maintained an active interest in that institution throughout his life. He enlisted in the US Navy during World War II and graduated from Harvard College in 1946 with a bachelor's degree in physics. Rosenbluth was a leading member of a remarkable group of physics graduate students at the University of Chicago during the postwar era. Four of those students eventually went on to win Nobel Prizes, and the group produced several directors